Lecture.

OSTITIS TYPHOSA.[1]

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SOME of you will recall to mind the case of a small boy that I operated on before you for an abscess of the bone following typhoid fever. This complication of typhoid is so important for you to be familiar with that it is my intention to devote this lecture to this subject. The history of the case is briefly as follows:

William F., age thirteen, had always been in fairly good health. When five years of age he had scarlet fever, from which he recovered without any complications. In September, 1898, he developed typhoid fever, which kept him in bed until the latter part of October. He then got up, and remained up and about, feeling in pretty good health, until November 10th, when he began to complain of a heavy feeling in the right leg.

In about five days after this there was some pain in the limb, and the patient then applied for treatment.

Examination of the chest was negative. The liver and spleen were normal in size and not tender when palpated. Analysis of the urine was negative. Blood count = 3,500,000; hemoglobin, 87 per cent.; no leucocytosis. Temperature 38.3° C.; pulse 96.

On the right leg, over the internal aspect of the tibia, and at about the middle of the bone, the skin was somewhat edematous and there was considerable pain on pressure, the entire area of pain being about five or six centimetres in extent.

After watching the patient for several days an operation was decided upon, as the pain was decidedly on the increase. An incision about eight centimetres long was made in the integuments, over the site of the pain, down to the bone. The periosteum, which was hyperemic and thickened, was next incised and stripped off the bone.

The bone was slightly swollen at this point, and was rather deep pink in color. Next, the bone was opened down to the medullary canal, which was found to contain a dark-colored, semi-liquid marrow. The cavity was then thoroughly curetted. A subgallate of bismuth gauze wick was packed into the cavity, the periosteum was sutured with catgut excepting for a space which was left for the passage of the wick, and the skin incision was closed with the bronze and aluminium wire.

The drain and skin sutures were removed on the fifth day, and perfect union had taken place. The patient was discharged cured about ten days later.

Cultures of the liquid taken from the cavity only gave an abundant growth of the staphylococcus aureus.

As is well known, the bacteria of the various acute infectious diseases possess the general peculiarity that they may give rise to affections in various organs of the economy quite independent of the specific affection which confines itself to certain viscera. During the course of scarlet fever, influenza, pneumonia, measles, diphtheria or gonorrhea secondary troubles are not infrequently met with. These secondary affections are closely related to the primary disease, and they are considered as due to the action of one and the same virus, but, of course, open to the possibility that under certain circumstances there may also be another added factor giving rise to their existence.

Generally speaking, however, the secondary affection should be put under the head of a real complication, and the relationship between the primary infectious disease and the complications was only discovered relatively within a few years. It was usually admitted that the organism became weakened by the infectious disease and was thus a prey to other septic processes, and so the infectious affections occurring in the bones after acute maladies, such as typhoid, etc., were not studied particularly, and no attention was given to them.

It is only during the last fifteen years, since we have become more familiar with the germs of infections and their manner of action, that their pathologic manifestations in the bones have been studied. Of all the infectious diseases typhoid fever certainly contributes the largest number of inflammatory lesions in the bones, and previously to 1880 little mention can be found of them in medical literature. The fact that diseases of the bone following typhoid were not attributed to their true etiology is because the secondary manifestation occurred some time after the acute disease had subsided, and the patient had been discharged as cured. Then the bone lesion developed, sometimes months afterwards, and the surgeon diagnosticated an osteomyelitis, or a syphilitic process in the bone, because all of these affections may closely simulate one another.

Witzel emitted the opinion that the treatment of typhoid by baths, which has of recent years enjoyed a certain amount of favor from the medical profession, was often the cause of traumatism, which might result in abscess formation; but although this may possibly have some bearing on the production of an ostitis following typhoid fever, still the majority of recorded cases show that traumatism did not occur, and consequently this theory cannot be accepted as explaining the etiology of many cases. Without any doubt, a patient is exposed at any time to traumatism, but the frequency of this sequel of typhoid would go to show that a traumatism is not necessary for its production.

Wilson is of the opinion that exhibition of antipyrin or antifebrin may set up an anilin anemia or cachexia, which is produced by the transformation of hemoglobin into methemoglobin, and the viscera being placed in a low vital condition from the fever, may explain the etiology of the process in the bones; all the pyrexias produce a lowered state of vitality in the various organs and tissues, and especially is this true of the bone marrow, as has been demonstrated by Ponfick, and changes take place in its structure and composition which makes it a *locus minoris resistentiæ*.

The first studies on ostitis typhosa were made in France, and, later, in England. In 1835 Maisonneuve wrote a thesis on periostitis, and in 1854 an article on the subject from the pen of the famous Chassaignac appeared in the *Gazette médicale de Paris*. Murchison, in 1873, and Paget, in 1878, contributed to the study of this affection, but to Keen, of Philadelphia, is due the most complete study of the subject that had appeared, and which was published in the form of the Toner lectures in 1877.

When the attention of the profession had been called to this type of ostitis by the above writings a large

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number of cases began to be reported, chiefly in France. Mercier, Levesque, Gelez, Terrillon, Rondu, Hutinel and others recorded cases, but the etiology was still very uncertain. Turgis upheld that osteoperiostitis following typhoid fever was due to a localization of the virus, which, under the influence of a general or accidental cause, found a favorable soil for its development. Freund was the first to give a really good and complete description of this affection, and he entirely upheld the opinion that there was a direct relation between the typhoid bacillus and the bone lesion, although at that time he was unable to sustain this idea by any bacteriological proof.

This demonstration was made by Ebermaier, who obtained pure cultures of Eberth's bacillus from the abscesses in the bones of various cases as well as from the blood taken from the tumefied periosteum. From these experiments the study and theory of post-typhoid bone affections were placed upon a firm basis.

The bone lesions following typhoid fever are due to an invasion of Eberth's bacillus, the organism taking on a pyogenic character. Much discussion has been brought up over this question. Baumgarten and E. Fraenkel, especially, deny the action of the bacillus of typhoid, and ascribe the bone lesions to a secondary pyogenic infection, and in support of their opinion, in cases where a pure culture of Eberth's bacillus has been obtained, they say that pyogenic cocci were first in the field, but afterwards became destroyed by the specific bacillus of typhoid.

It is perfectly certain that during the course of a typhoid fever an infection due to pyogenic bacteria can arise, especially when the human organism is in a state of receptivity and forms an excellent media for their proliferation and growth, but, generally speaking, this does not happen.

Baumgarten has said that a disease like typhoid, which so reduces the general resistance of the economy and attacks the vital organs, and disabling them in their physiological functions, renders the growth and invasion of pyogenic germs an easy matter. The intestine usually contains a number of pus-producing bacteria, even streptococci and staphylococci, and they can invade the body through the intestinal ulcerations with comparative ease.

The significance of a mixed infection is most prominent in cases where only pyogenic organisms are found in the pus of ostitis typosa, the typhoid bacillus having disappeared, but you will remember that when lecturing on the pathogenic bacteria I pointed out that Eberth's bacillus would take on pyogenic properties.

Dmochowsky and Janosky injected a mixture of typhoid bacillus and pyogenic cocci into animals, and in the abscesses produced both organisms were found associated, or, on the other hand, the typhoid bacillus had disappeared and only the pyogenic cocci remained. The lesser vitality of Eberth's bacillus accounts for this, and the cocci had simply won a victory, and in no instance could it be experimentally proven that the typhoid organism had outlived the other bacteria.

From these facts, these experimenters maintain, and with good reason, that pus in which the typhoid bacillus is alone present was produced by the presence alone of this organism.

Pyogenic cocci are often found along with Eberth's organism in many instances, and then it is somewhat difficult to decide which of the two was the etiological factor, but in all probability the latter prepared the ground for the second and was the first in the field. Just as the diplococcus of pneumonia produces a lobar pneumonia, resulting in abscess formation or a general infection, so can Eberth's bacillus set up localized inflammatory foci after it has produced ulcerations of the intestinal glands. That such is the case is too well known at the present time to call for further discussion.

Pure cultures of Eberth's bacillus have been obtained in bone infections, foci of suppuration in the muscles and skin; in acute endocarditis, sero-fibrinous pleuritis, circumscribed periostitis, cerebro-spinal meningitis, suppurating strumitis, and in abscesses of the spleen and mesentery glands; all this simply goes to show how varied may be the action of this organism on the human body.

Why the typhoidal bacillus more often produces an ostitis as a sequel of the fever may perhaps be explained from the fact that Quincke found the organism present in the bone marrow of typhoid patients, although there was no lesion present in the bone. Ebermaier very properly points out the similarity between bone marrow, the intestinal follicles and the mesenteric glands; and since the last two structures are invaded and rendered the seat of pathologic changes by the organism it is evident that the bone marrow may likewise be attacked. For that matter, Prasick has sufficiently proven that pathologic changes do take place in the bone marrow of typhoid patients.

The localization of the specific bacillus in the bone marrow is evidently greatly favored by the slow circulation which takes place. If, therefore, it be supposed that the specific bacillus is present in the bone marrow of patients afflicted with typhoid, the question arises why ostitis is not more frequently met with as a sequel of this disease. Whether traumatism, exposure to cold, or the great virulence of the bacillus is the cause for the production of ostitis is as yet an open question, but in scarlet fever we frequently meet with foci of suppuration in various organs, and although the irritating virus of this disease is constantly passing through the renal gland, still nephritis is far from being an ordinary complication in this affection.

The tibia is by all odds the bone most frequently attacked, but the ribs, femur, humerus, ulna, skull, clavicula, sternum, fibula, radius, scapula, pelvis and vertebræ may also be the seat of typhoid ostitis. In many instances several bones may be attacked. The bone lesions usually appear eight or ten weeks after recovery from the fever has taken place, but in some cases ostitis has developed during the first, second or third week of typhoid.

The final result of ostitis following typhoid is usually abscess formation, or it may be that a necrosis will occur. Young people are usually affected; old persons seem to escape this complication. From statistics, it would appear that males are more frequently attacked than females.

Every case of typhoid fever, no matter how mild it may be, may give rise to an ostitis. The affection will usually develop in the epiphysis of the long bones, and, as I have already said, the tibia is the bone most frequently attacked. The bones of the upper extremities and those of the skull are not so frequently the seat of this complication, but the ribs are most probably next in frequency after the tibia the site of predilection for this pathologic process. The bone lesions develop during the height of the fever, or, what is more frequent, during convalescence from the affection, or even at a

later date, and several months have been known to pass before ostitis appeared.

The process generally develops suddenly without any previous symptoms which would call the patient's attention to any trouble in the bone. Occasionally the first thing that attracts attention is a feeling of fatigue in the affected limb, but the first real striking symptom is a deep-seated spontaneous pain in the affected bone. This pain is at first diffused, but later becomes localized to the spot where the lesion is developing. After a few hours or more a sharply-defined tumefaction appears, the skin covering it remaining quite normal in color. This tumefaction will be found on palpation to be closely adherent to the underlying bone and is very hard to the touch.

Occasionally, especially in the more acute cases, one or several bones are suddenly the seat of pain, and this is very rapidly followed by visible changes in the parts.

When the lesion is deeply seated in the bone tumefaction is naturally absent, but the patient complains of a feeling of weight in the diseased bone. Pain may take on a very high degree of acuteness and is often more accentuated at night, so that it becomes unbearable. After a few days the pain and feeling of tension decrease and soon disappear.

The functional disturbances in the limb attacked vary in intensity, but they are always present to some extent.

Ostitis typhosa will end in one of the three following ways, namely: (1) by absorption of the tumor; (2) the tumor becomes indolent and very tense, and may exist as such for several months and then finally disappear; (3) by the formation of pus or a necrosis. Abscess formation or necrosis is by far the most frequent. The majority of cases in which the bone lesion appears during or after convalescence take this course. Perhaps this fact may be explained by Buchner's theory, namely, that the bacteria present undergo an involution, or have died off, but their toxins being still present as a pyogenic matter, while at the time of their greatest development this pyogenic property was not prominent.

Even the slowly developing, indolent tumefactions may occasionally end in abscess formation, the latter taking on a very chronic evolution.

A spontaneous recovery very rarely takes place, and in most instances surgical measures are required. If the process goes on to necrosis we will then find lesions similar in every respect to those met with in acute osteomyelitis. Irregular cavities are found in the bone which are lined with granulation tissue, sequestræ, fistulæ and thickened periosteum; in other words, the same pathologic changes in no way distinguishable from those produced by a pyogenic inflammation from any other infectious cause.

Klemm believes that the pus in ostitis of typhoid is distinctly different in color and general make-up from that usually produced by the staphylococcus or streptococcus. The pus in this particular form of ostitis is either a dark or light reddish-yellow color; it is usually rather thin, and has a slight odor, and is, according to the above-mentioned authority, characteristic of Eberth's bacillus. It is poor in colloid matter, but contains a considerable amount of tissue *débris*. Klemm consequently believes that this exudate produced by the bacillus of typhoid should not be termed "pus," and he terms this liquid "a fluid metamorphosis of the pathologic products deposited in the bone." In a number of cases this definition is quite suitable, namely, where the regressive metamorphosis is a result of the necrotic action of the bacillus of typhoid. But in other instances the term "pus" is certainly most correctly applied.

The experiments of Dmochowsky and Janowsky have well proven that abscess formation in animals inoculated with Eberth's bacillus has the same properties as pus produced by the various other pyogenic organisms, and Parsons has come to the same conclusions in the case of man.

Microscopical examination of pus from ostitis typhosa does not show a material difference from that due to the streptococcus or staphylococcus, only in some samples of the former there are very few blood corpuscles.

There is one symptom of typhoid bone infections that must be mentioned, and that is fever. You would naturally suppose that an elevation of the temperature would be present in these cases, but such is not the case. Marked fever has only been mentioned by Fürbringer and Ebermaier, and Parsons remarks that "there is, as a rule, an entire absence of fever." This may apply to the cases under his own observation, but a rise in the mercury is to be expected at some period of the affection, usually at the time when pain is present, as was the case with our patient.

The fever takes a hectic type and its height is in direct proportion to the extent of the lesions. When the pain subsides the temperature gradually drops to the normal. A very sudden and high fever accompanied by chills is usually the sign of an acute osteomyelitis and bacteriological examination will reveal the presence of the staphylococcus aureus or the streptococcus, but never Eberth's bacillus.

Those cases having a very chronic evolution are usually apyretic, and are symptomatically very similar to tubercular abscess, and are usually due to a pure typhoid bacillus infection. The diagnosis is difficult, and can often only be made with certainty by a bacteriological examination.

The prognosis of ostitis typhosa is good, and as yet no fatal end directly due to this affection has been reported, so far as I know.

As to treatment, we may try cold applications, leeches, and rest in bed during the acute stage, but when abscess forms, or if there is a necrosis of the bone, a free incision must be made, and all diseased tissue removed by the curette, hammer and chisel.

Original Articles.

ABDOMINAL HYSTERECTOMY FOR CANCER OF THE CERVIX.

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The relative advantages of abdominal and vaginal hysterectomy for diseases within the pelvis in general, and cancer of the uterus in particular, have already been so exhaustively discussed and argued that very little is left to be said upon that subject. Still I cannot refrain from saying a few words in regard to this question of choice of operation.

I believe that in all cases of cancer at the os the operation chosen should be abdominal hysterectomy.